Pedestrian Priorities

Unraveling Walkability Challenges in Shah Alam's Neighborhoods

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Abstract – This article explores the contemporary shift in urban studies towards prioritizing walkable neighborhoods amidst growing concerns about urban sprawl and its environmental impacts. Focusing on Persiaran Bestari in Shah Alam, Malaysia, the research aims to address the lack of pedestrian-friendly infrastructure and the consequent reliance on vehicular transport in residential areas. This research utilizes a mixed-method approach incorporating quantitative and qualitative methodologies, combining space syntax analysis and behavioral mapping to examine pedestrian movement within the study area. The data collection involves gathering pedestrian infrastructure data through field surveys and pedestrian volume surveys. As the result, behavioral mapping observations revealed varying pedestrian activity levels along different road corridors, with significant pedestrian traffic concentrated around residential zones. Utilizing space syntax analysis, the research detected that Persiaran Bestari and Permai experienced the highest levels of social and commercial activity, indicating higher resident density in these areas. This research highlights the correlation between pedestrian comfort and safety and the availability of pedestrian infrastructure. It reveals that inadequate infrastructure leads to poor walkability, prompting pedestrians to favor safer routes, such as neighborhood or local roads with reduced and slower vehicle traffic.

Keywords: accessibility, pedestrian, space syntax, walkability.

I. INTRODUCTION

The current trajectory of urban studies reexamines the impact of urban sprawl that has unfolded since the early modern era, marked by the widespread adoption of motorized vehicles as a dominant mode of transportation (Rahman et al., 2023). In today's context, increased awareness of global warming and extreme climate change is prompting a reassessment in urban studies, shifting the focus towards establishing walkable neighborhoods (Baobeid et al., 2021). The principles of New Urbanism advocate for walkability, shaping urban patterns that cater to the needs of pedestrians (Cysek-Pawlak & Pabich, 2021). This renewed interest in New Urbanism is not only experiencing a resurgence in popularity but is also emerging as the essential approach that contemporary society should actively embrace.

Sprawl areas are distinguished by compromised mobility and a substantial carbon footprint (Yasin et al., 2021). Typically, sprawl prioritizes vehicular mobility toward the city center, while neglecting

mobility within the sprawl neighborhoods. Jane Jacobs introduced a theory on 'border vacuum', defining them as physical elements at the urban boundary that potentially impede pedestrian movement (Gómez-Varo et al., 2022). This hindrance results from the development of transportation infrastructure such as railways, highways, main streets, often neglecting pedestrian accessibility (Vidal Domper et al., 2023). Border vacuums act as barriers for pedestrians, both physically and mentally, making it challenging to traverse, with dangers such as road crossings. Talk about border vacuum.

Shah Alam, originally part of the sprawl in the Klang Valley situated 20 km west of Kuala Lumpur, has evolved into the capital of Selangor State in Malaysia (Loh & Brieger, 2014). This research focuses on a specific neighborhood within Seksyen 7 Shah Alam, specifically examining Persiaran Bestari as the study area—a residential zone. Initial investigations have brought attention to walkability issues in this locale. The area currently lacks pedestrian-friendly attributes due to inefficient design and the loss of pedestrian network linkages. Preliminary interviews with residents of Seksyen 7 revealed that pedestrians often experience fatigue due to the absence of appropriate facilities. The point of destination is considerably distant from pedestrian walkways, prompting individuals to opt for vehicles rather than walking.

Like many other cities in the global south, Shah Alam is confronted with the threat of heatwaves that discourage people from walking (Braga & da Silva Moreno, 2021). Emphasizing the need for prioritizing accessibility for pedestrians becomes crucial in such unfriendly weather conditions, ensuring that streets are effectively designed to accommodate pedestrian movement. Moreover, the Shah Alam Municipality is actively committed to promoting a low-carbon lifestyle by investing efforts into the Low Carbon City (LCC) initiative (Abdullah et al., 2022). This initiative aligns with the goal of enhancing walkability in former sprawl areas. As Shah Alam seeks sustainable urban development, fostering walkable environments not only addresses weather-related challenges but also contributes to the city's broader commitment to a low-carbon lifestyle.

Previous study on Shah Alam has evaluated the walkability of the neighbourhood resulting 30% car dependent, 42 % somewhat walkable, and 28% percent is walkable (Mohd Noor, 2021). A questionnaire research has been conducted in Shah Alam, found that people are more likely to drive rather than walk (Nasrudin et al., 2023). Majority respondent in Shah Alam only willing to walk for 500 meters (Nasrudin et al., 2020). While for utilitarian walk and relaxed walk, only minority group of socio-demography that willing to do that in Shah Alam (Talmizi et al., 2022). In the theory of outdoor activities, Jan Gehl (2007) explain that only if the physical element is well design and comfortable, people will more willing to do outdoor activities. In these case, walking activities in Shah Alam need better design which in this paper will focus on the accessibility for walking.

The overall goal of this study is to identify barriers and obstacles that impede accessibility and connectivity for pedestrians in Persiaran Bestari Seksyen 7 Shah Alam. This involves pinpointing physical barriers like stairs, uneven surfaces, or the absence of curb cuts that hinder pedestrian movement. The strategy aims to enhance the comfort, safety, and overall environment of the pedestrian network in the area. The research addresses specific questions, including the current state of connectivity and accessibility in the study area, the relationship between transportation network connectivity, accessibility, and environmental quality indicators, and the perceptions and concerns of pedestrians regarding lifestyle, safety, and comfort.
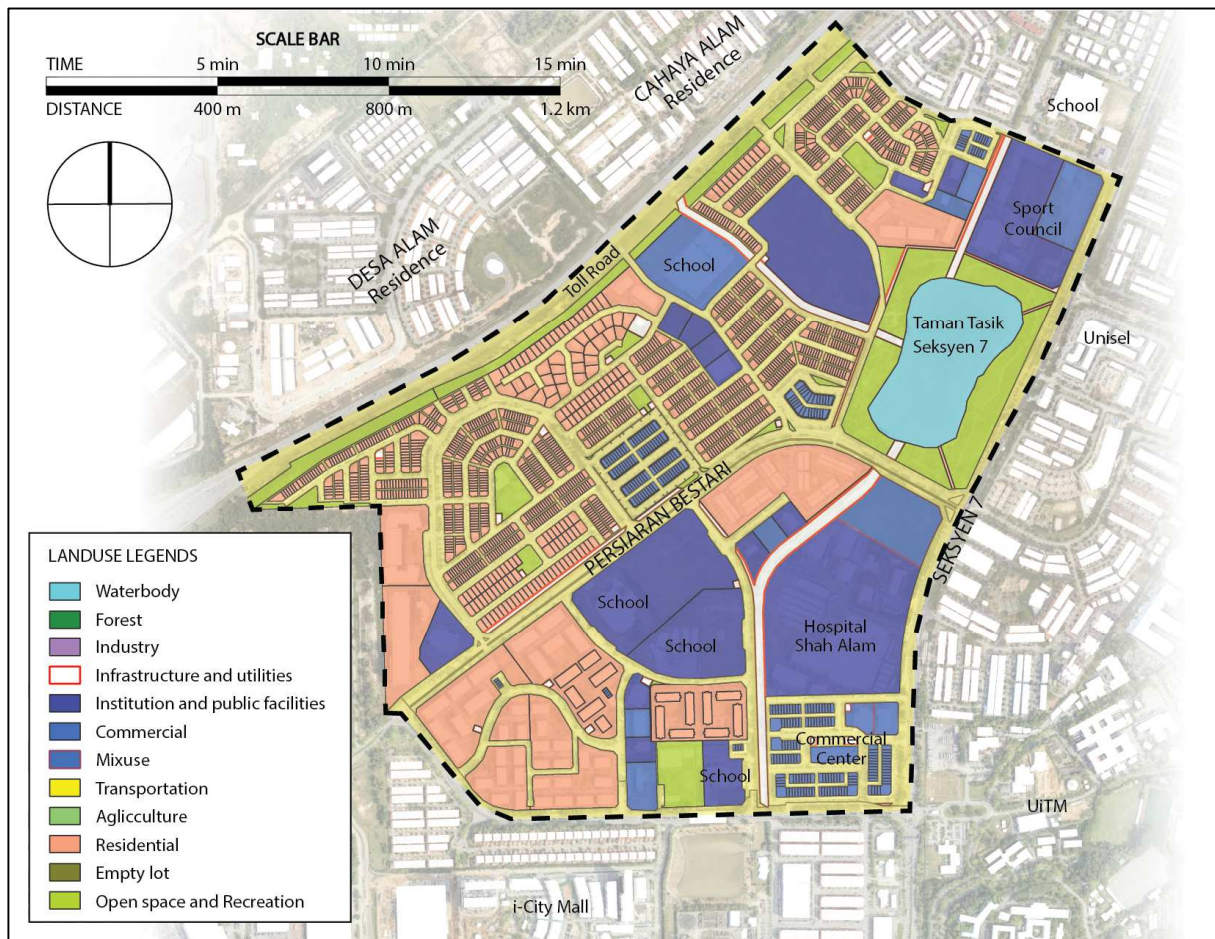
II. METHODOLOGY

A. Study area

The study area, the Persiaran Bestari Neighborhood, is located in Shah Alam. It is surrounded by Kuala Selangor and Selayang districts to the north, Subang Jaya and Petaling Jaya cities to the east, Klang district to the west, and Kuala Langat district to the south. Shah Alam has a pattern where residential areas take up the majority of the city (55.2 km2) while business sectors are dispersed throughout the many "Seksyen." Shah Alam can often be separated into the north, center, and south regions. All the state government offices and agencies are located in Central Shah Alam. It comprises Sections 1 through 24 (seen as beige areas on the map). The city is home to a number of shopping centers, including Aeon Shah Alam Seksyen 13, Plaza Alam Sentral (commonly known as PAS), SACC Mall, Plaza Shah Alam, and Ole-Ole Seksyen 18. The population of Shah Alam has grown from about

40,000 originally to more than 600,000 today, due in part to the opening of several technical and vocational colleges and the development of industrial parks on the outskirts of the city. A mass transit system and a series of modern highways link the city to Kuala Lumpur and other urban areas in the Klang Valley, as well as to the two airports in the area.

The boundary of the study area has a total area of 290.3 km2 (see Fig. 1). The topography is mostly flat, except in the northern part of the city where it features a prominent rolling hill. That character provides comfort for walking. The area is surrounded by several important facilities and landmarks such as UiTM and Unisel universities on the east side, I-city mall on the south, Klang district on the west, while other residences and toll roads stretch out on the north side. The land use in this area is mixed with residential zones, public facilities, and commercial zones. The open space is spread evenly to provide the nearest access for each residential cluster. There are about 5 to 7 residential clusters in this area, making walkability important for placemaking in this neighborhood. From the perspective of walkability analysis for the neighborhood, residential zones in the area act as generators for pedestrians while recreational areas, water bodies, commercial areas, and public facilities act as attractors for pedestrians. Inside the boundary, there are several focal points that can attract pedestrians such as commercial centers, parks, schools, and hospitals.

Fig. 1. The location of the study area, Seksyen 7 Shah Alam
Source: Authors (2024)

B.   Research Approach

This research employs a mixed-method approach combining quantitative and qualitative methodologies. It integrates space syntax analysis and behavioral mapping to study pedestrian movement in the designated area. The chosen methodology draws inspiration from previous studies. For instance, Özbek et al. (2022) utilized space syntax analysis to understand how urban grid configuration affects pedestrian movement patterns. Similarly, Yıldırım and Çelik (2023) utilized behavioral mapping to observe and comprehend pedestrian movement density and its correlation with space syntax

simulation results.

The primary data collection approaches include gathering pedestrian infrastructure data, conducting field surveys, and employing pedestrian volume surveys (utilizing behavioral mapping techniques). A guideline, derived from best practices in pedestrian planning infrastructure, was utilized to outline the inventory of pedestrian infrastructure in line with selected elements, criteria, and measurements within the study site. This inventory survey and interviews primarily focused on paths, sidewalks, crosswalks, street furniture and amenities, and roofing and shading.

Secondary data were primarily sourced from relevant agencies and other literary sources. The pedestrian volume survey was conducted using manual traffic counters at specific times along each route. This survey aimed to gather extensive pedestrian traffic data to assess the utilization of available pedestrian infrastructure within pedestrian corridors. A manual traffic counter was employed for data collection, determining the areas or routes to collect data based on on-site observations and focus groups utilizing pedestrian networks.

These spots are critical for analyzing pedestrian movement along major route corridors and observing variations in pedestrian volumes at different locations. The volume count was conducted along each selected route at various times throughout extended periods, including weekends and weekdays from 7 AM to 6 PM. Interviews in this research utilized random sampling of pedestrians encountered during observations. Interviewing the public regarding urban issues has proven effective in decision-making processes and creating people-centric spaces (van Renswouw et al., 2023). The interviews aimed to gather data on factors posing challenges to pedestrian movement.

Subsequently, both primary and secondary data were evaluated using various methods, including graphical approaches, cross-reference studies, and weighted averages. Data analysis involved spatial analysis, specifically space syntax, which measures the ease of movement within a space by calculating connections or accessibility to other spaces in the environment (van Nes & Yamu, 2021). Axial maps generated from space syntax analysis were processed using specialized software, highlighting integrated and disintegrated urban spaces through color gradients. The most integrated spaces, highlighted in red, are public areas serving both residents and tourists (Matejcek & Pribyl, 2020). The global integration core of the settlement is identified where red-colored areas converge. Locally analyzed axial maps reveal the relationship between subspaces in the system, indicating areas offering more services to local users and deemed "more special" (Hillier & Hanson, 1984).

III. RESULTS

By conducting behavioral mapping observations, we pinpointed road corridors with varying degrees of pedestrian activity, as illustrated in Figure 2. Notably, significant pedestrian traffic was concentrated primarily around residential zones, highlighting these areas as key hubs for pedestrian movement. Specifically, major pedestrian movements were predominantly observed along local or neighborhood roads, with this corridor being particularly frequented by parents and children. In contrast, minor pedestrian activity was observed along primary thoroughfares, where fewer people were observed walking. Pedestrian movement patterns were primarily centered around attractions such as schools, parks, and commercial areas.
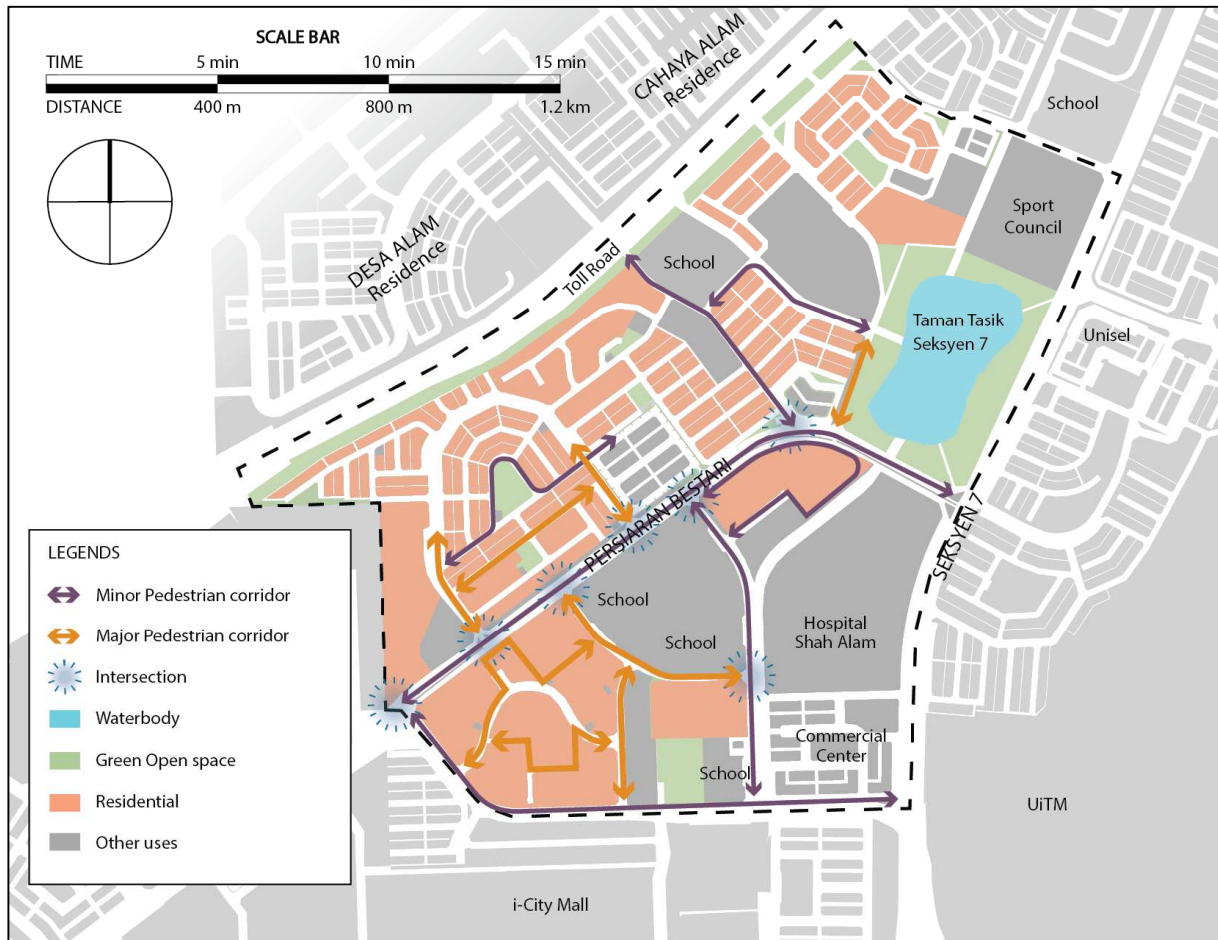
Fig. 2. Circulation on Pedestrian Network
Source: Authors (2024)

The length of time that people can comfortably walk varies based on several variables, including age, level of fitness, health status, and personal preferences. While it is challenging to give precise walking distances for each age group, it can a sense of how far people in various age groups often walk. These measurements are approximate and might differ greatly from person to person. The data present the point of movement people walked from areas to the destination place (see Fig. 3) based on 400 meters radius or five minute walking (Nagy & Păcurar, 2020). Besides that, people mostly walked and travel within the area near their houses and institutions. The far they walked to their destination almost one kilometre. For examples include going on foot to a friend's house, a park, or a nearby convenience shop. Short distances might be as little as a few hundred metres or as much as a kilometre. When studying pedestrian movement, it's crucial to identify pedestrian generator and attractor nodes to comprehend movement patterns (Adi et al., 2020).
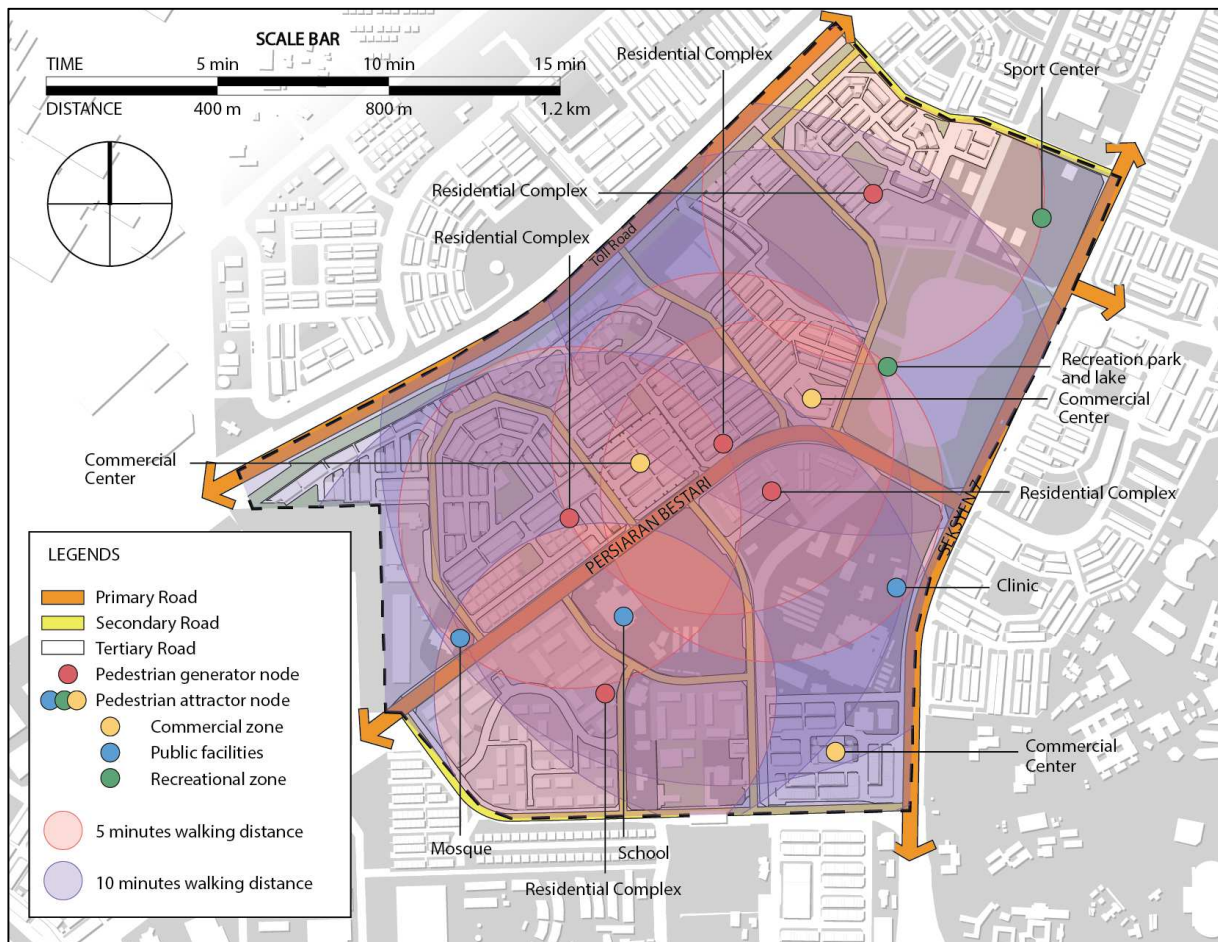
Fig. 3. Data of walking distance people could walk
Source: Authors (2024)

This research synthesized factors contributing to walkability issues in the study area through data collected via pedestrian interviews (see Table 1). These factors are categorized into five elements, including sidewalks, crosswalks, street furniture, and shading.

Table 1. Walkability Factors in the Study Area

Elements	Factor	
Walkway and sidewalk (the existing space to walk)	1	Non-compliance with guidelines leading to narrow spaces, causing walking difficulties, especially for disabled users.
	2	Compliance with guideline measurements.
	3	Sufficient space to walk.
	4	Minimal compliance with guidelines for walkway and crosswalk spaces.
	5	Disconnection of pathways due to lack of spaces.
Crosswalk and intersection	1	Strategically located crosswalks.
	2	Connect minor activities but are distant or at corners.
	3	Insufficient intersections, particularly in school and traffic light areas.
	4	Inconsistent presence of crosswalks on roads.
	5	Lack of maintenance of crosswalk and intersection paint.
Street furniture and amenities	1	Limited installation of street furniture and amenities, concentrated in specific areas.
	2	Limited variety of street furniture and amenities.
	3	Some furniture and amenities are broken and poorly maintained.
	4	Predominantly located in major activity areas.
	5	Proper street lighting adhering to guidelines, with correct measurements and specifications along all roads.
Roof and shades	1	Respondents experience walking wet in the rain or sweating heavily due to lack of shelter.
	2	Shelter provided in critical areas such as schools and commercial zones.
	3	Presence of trees offering shading along walkways, encouraging pedestrian activity.

Source: Authors (2024)

Utilizing space syntax analysis, we conducted an examination of connectivity and integration, as depicted in Figure 4. The data is represented on a colored axial map, where blue signifies low values and red indicates high values, with a spectrum of other colors in between forming a gradient. In our connectivity analysis, we observed that primary roads exhibit high connectivity, given their function as collector routes. However, despite lower connectivity, secondary and tertiary roads displayed higher pedestrian activity compared to the primary road. Integration serves as a measure of how effectively a line or location is connected to the overall system in terms of visibility or accessibility (Zaleckis et al., 2022). The area with the highest integration was observed along the Persiaran Bestari roads. Notably, there is a greater integration along major roads connecting school and residential areas, as evidenced by the color range on the map. This data suggests that Persiaran Bestari and Permai experience the highest levels of social and commercial activity among the streets analyzed, indicating a higher density of residents in these areas.

Fig. 4. Connectivity and integration analysis
Source: Authors (2024)

The infrastructure elements in Seksyen 7 Shah Alam are intended to facilitate pedestrian mobility and safety. These elements encompass various features such as sidewalks, crosswalks, footpaths, pedestrian bridges, ramps, curb cuts, pedestrian signals, and related amenities. The sidewalks along Persiaran Bestari in Seksyen 7 Shah Alam serve as a functioning as gateways to the city and fostering social and commercial activity. Accessible and secure pavements constitute a crucial investment for residents, offering an alternative to vehicular transportation. The gathered data enables identification of flaws, prioritization of areas for improvement, and guidance for the selection of new pedestrian infrastructure.

IV. DISCUSSION

This paper investigates the primary factors influencing the effectiveness of the pedestrian network and the requirements of students and residents in Persiaran Bestari, Seksyen 7, Shah Alam. The graphical method has been employed in this study to analyze data and address issues by presenting information in graphs or charts. This approach involves plotting data points on a graph to identify any emerging patterns, trends, or relationships. These methods are utilized to collect and assess information concerning pedestrian movement patterns, connectivity, and accessibility in urban areas. A cross-referenced study was conducted by comparing best practices in connectivity and pedestrian access.

The findings of the study in Persiaran Bestari, Seksyen 7, Shah Alam, primarily serve to address the research objectives and aims of the study. To this end, surveys were conducted at various locations, including Persiaran Bestari Road, Persiaran Permai, and Plumbum Roads. According to the survey results, there were no pedestrians with disabilities observed using the Routes on a daily basis. Instead, pedestrians utilizing the Routes were predominantly residents of residential areas and students residing near schools, houses, and apartments (see Fig. 5).
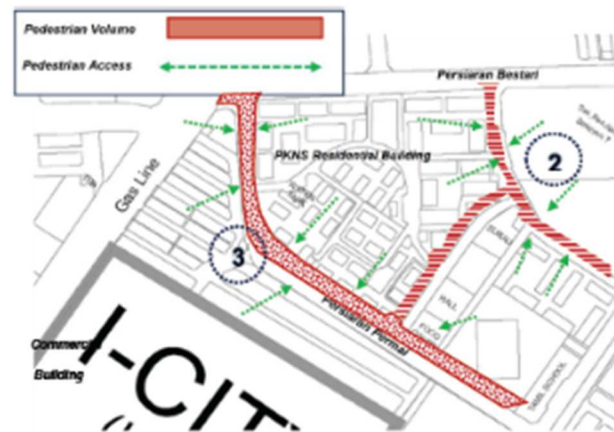
Fig. 5. Average pedestrian volume at different roads
Source: Authors (2024)

Figure 6 depicts the trends in pedestrian volume along Routes 1 to 3. Pedestrian volume was analyzed using camera recordings taken hourly throughout the day. Route 1 exhibits an increasing and high trend of pedestrian movement, particularly along Route 3 during the morning hours. The peak pedestrian volume, reaching 90 at point 1, occurs between 0700 and 0800. This movement is evidently influenced by the activity and condition of pedestrian infrastructure along the routes corridor. Moreover, Route 1 benefits from the presence of Seksyen 7 school and PKNS Apartments, which contribute to the overall connectivity of the pedestrian network (see Fig. 7). These observations suggest that residents in the surveyed regions often accompany their children to school and recreational areas.
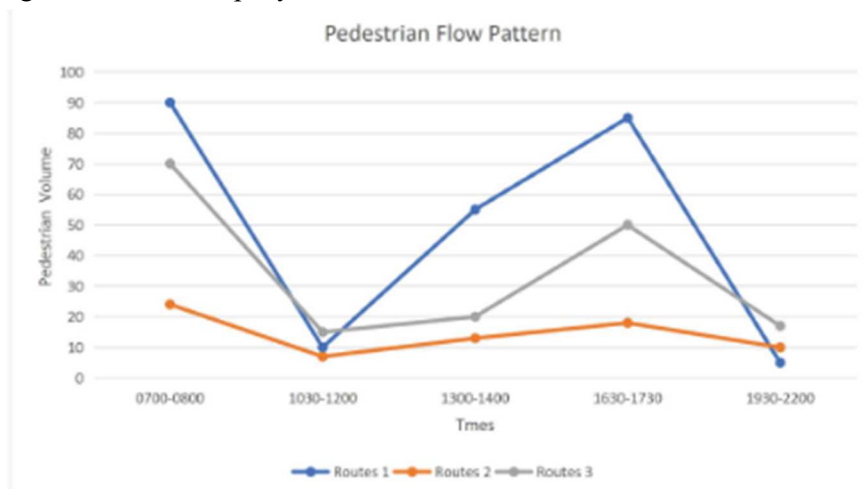

Fig. 6. Pedestrian flow pattern at different Routes
Source: Authors (2024)

Fig. 7. Pedestrian flow pattern at different routes
Source: Authors (2024)

In Figure 8, Route 2 illustrates a steady increase in the average pedestrian volume per hour from Point 1 to Point 2, indicating a distinct pedestrian flow pattern. The average flow along Route 2 typically ranged from 10 to 20 individuals, comprising mainly workers and residents of nearby buildings. Additionally, Route 2 is slated to have a future LRT 3 line, scheduled to open to the public in 2024. The Seksyen 7 Shah Alam LRT station (i-City/Hospital Shah Alam) is part of the Light Rapid Transit (LRT) system serving Seksyen 7 in Shah Alam, Selangor, Malaysia. This station is a pivotal stop on the planned Shah Alam line, which forms an integral component of the Klang Valley Integrated Transit System.
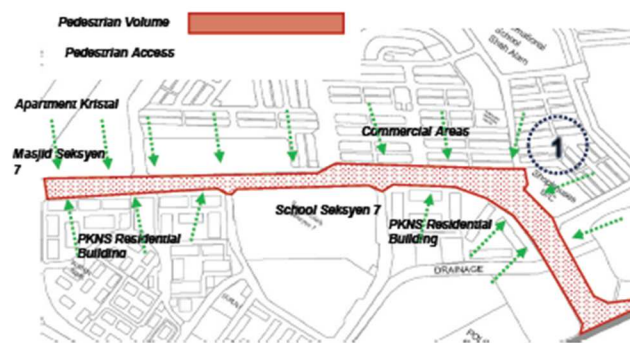
Fig. 8. Pedestrian volume access at Routes 3
Source: Authors (2024)

This street experiences high pedestrian density due to the presence of various pedestrian-oriented businesses, such as cafeterias, restaurants, clinics, stationery stores, and phone shops. The survey conducted on Route 3 took place on a Friday after individuals had attended Friday prayers. Situated between Kristal Apartment and PKNS Apartments, the location of the Masjid attracted pedestrians to Route 3, making it a focal point for this study.

The findings can be summarized as follows:

1. An increase in respondents' satisfaction with "motor traffic and speed" by one unit resulted in a 52% increase in the likelihood of choosing the shortest route, as revealed by an analysis of factors influencing primary school pupils' route selection. This indicates a preference for safer routes, even if they are longer, particularly in environments with heavy vehicle and pedestrian traffic.
2. Traffic surveys aim to accurately capture real-world traffic conditions in the area. These surveys may involve counting vehicles on a road or collecting data on traffic volume. Additionally, traffic volume can vary significantly based on factors such as the day of the week or time of day.
3. The traffic volume on Persiaran Bestari road experiences congestion due to high pedestrian volume near schools and residential areas. This congestion results from insufficient pedestrian infrastructure, which prompts pedestrians to use the road alongside vehicles. Addressing behavioral issues and improving facilities in common areas can alleviate traffic congestion.

The space syntax method has contributed to understanding how the spatial integration of street and road networks influences movement flows, economic activities' locations, and street life (Hillier, 1996; Penn & Turner, 2002).. This study focuses on walkable accessibility and connectivity in pedestrian network analysis, particularly within a 400-meter radius, equivalent to a 10-minute walk. The study area, Persiaran Bestari Seksyen 7, exhibits a considerable network of good local integration scores, indicating potential for improving pedestrian circulation (see Fig. 9). However, areas surrounding residential and institutional arterials prioritize heavy motor traffic, presenting barriers to pedestrians despite being well-integrated for walkability. This emphasizes the importance of enhancing infrastructure and accessibility to promote pedestrian-friendly environments.

Fig. 9. Total Depth of connectivity potential range by colour
Source: Authors (2024)

By examining the metric segment map within the radius of 400m, Total Depth, and choice values were determined. These ideals can be found in the city's core, where there are many Residential areas. The maximum integration value is 1402, the average is 0.589, and the bottom 1. The greatest choice value is 145304, the average is 58823, and the lowest value is 0 (see Fig. 10). The study area contains 496.794 node counts and 1219.59-total connectivity. Figure displays the maps produced using the Choice and Total Depth and selection values of the city of Seksyen 7, Shah Alam Street network.

Fig. 10. Choice of connectivity potential range by color.
Source: Authors (2024)

Other than that, when pedestrians are prevented from moving from one place to another by physical obstacles such as blocked streets, a lack of walkways, or other obstructions, it is said that the pedestrian network has lost connection. As a result provide enough money and resources in the city budget for pavement upkeep. Make investments in pedestrian infrastructure a top priority to guarantee that all locals may use and enjoy well-maintained pavements. Establish a schedule for the regular sidewalk inspections that the city's authorities will do. Inspections should prioritise pedestrian zones with heavy traffic, identify sections that require repair, and quickly resolve any safety issues. Simplify

the procedure for reporting and fixing problems with pavements. Provide residents with easy ways to report damaged pavement by hotline numbers, websites, mobile applications. Make certain that concerns are resolved promptly after they are reported. Participate in neighbourhood gatherings to spread the word about the value of maintaining sidewalks. Encourage locals to take pride in their neighbourhoods by reporting problems with the pavements and getting involved in clean up and beautification initiatives.

V. CONCLUSION

The transportation network includes significant pedestrian facilities such as pavements, shared-use routes, and other similar areas. Regardless of the principal mode of transportation preferred (car, bus, or train), almost everyone uses pedestrian facilities at some point during almost every trip. Because of this, it's critical to offer durable, all-season pedestrian facilities that can be used by individuals of all abilities. Many neighbourhoods in Shah Alam lack suitable pedestrian infrastructure like as sidewalks, crosswalks, and pedestrian-friendly street patterns. This deficit presents substantial obstacles to pedestrians, raising safety concerns and discourages walking as a form of transit. The lack of adequate pedestrian infrastructure increases pedestrian safety risks, especially in regions where pedestrians must share the road with vehicles. This raises the danger of accidents and injuries, particularly among vulnerable populations such as children, the elderly, and those with disabilities. The issues with walkability in Shah Alam highlight the need of pedestrian-friendly urban planning and design. There is a need for comprehensive planning techniques that include pedestrian infrastructure into the built environment, ensuring safe and accessible walking paths for all communities.

Additionally, in community engagement with local communities is critical for understanding pedestrian needs and preferences in Shah Alam. Community participation can assist identify priority areas for pedestrian improvements and lead the creation of specialised solutions that address the unique difficulties that each neighbourhood faces. Due to that, Effective policy intervention is critical to increasing walkability in Shah Alam. This includes enacting and enforcing legislation that prioritise pedestrians in urban planning decisions, allocating adequate funds for pedestrian infrastructure projects, and promoting efforts that encourage walking as a sustainable method of transportation. Addressing walkability issues necessitates coordination among a variety of parties, including government agencies, urban planners, developers, community groups, and citizens.

By collaborating, these stakeholders may combine their knowledge and resources to execute comprehensive solutions that improve walkability and create more pedestrian-friendly neighbourhoods in Shah Alam. A coordinated effort encompassing infrastructure upgrades, safety enhancements, urban planning reforms, community involvement, policy interventions, and multi-stakeholder collaboration is needed to address the walkability issues in Shah Alam's neighbourhoods. Shah Alam can develop more pedestrian-friendly, accessible, and lively neighbourhoods that encourage walking as a sustainable and pleasurable form of transportation by giving priority to walkers and putting specific ideas into practice.

REFERENCES

Abdullah, Y. A., Jamaluddin, N. B., Yakob, H., Hassan, M. A., Nasrudin, N., Yusup, M., Zaki, Z. A., & Zanudin, K. (2022). Urban Governance Approaches for Low Carbon Cities. The Case of Shah Alam Local Government, *Malaysia. Planning Malaysia, 20*(4), 311–330. https://doi.org/10.21837/pm.v20i23.1169

Adi, A. F., Marlina, A., & Rahayu, P. (2020). The Study of Connectivity at Jalan Slamet Riyadi, Surakarta Using the Space Syntax Analysis. *IOP Conference Series: Earth and Environmental Science*, *447*(1), 012006. https://doi.org/10.1088/1755-1315/447/1/012006

Baobeid, A., Koç, M., & Al-Ghamdi, S. G. (2021). Walkability and Its Relationships With Health, Sustainability, and Livability: Elements of Physical Environment and Evaluation Frameworks. *Frontiers in Built Environment*, 7, 721218.

Braga, D. R. G. C., & da Silva Moreno, R. (2021). Prioritizing the Implementation of Walkable Green Spaces: An Analysis Under Climate Change in a Global South Megacity. In W. Leal Filho, U. M. Azeiteiro, & A. F. F. Setti (Eds.), *Sustainability in Natural Resources Management and Land Planning* (pp. 343–356). Springer International Publishing. https://doi.org/10.1007/978-3-030-76624-5_20

Cysek-Pawlak, M. M., & Pabich, M. (2021). Walkability – The New Urbanism Principle for Urban Regeneration. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 14(4), 409–433. https://doi.org/10.1080/17549175.2020.1834435

Gehl, J. (2007). Three Types of Outdoor Activities: Life Between Buildings, and Outdoor Activities and the Quality of Outdoor Space. In M. Carmona & T. Steve (Eds.), *Urban Design Reader*. Elsevier.

Gómez-Varo, I., Delclòs-Alió, X., & Miralles-Guasch, C. (2022). Jane Jacobs Reloaded: A Contemporary Operationalization of Urban Vitality in a District in Barcelona. *Cities*, *123*, 103565. https://doi.org/10.1016/j.cities.2022.103565

Hillier, B. (1996). *Space is the Machine: A Configurational Theory of Architecture*.

Hillier, B., & Hanson, J. (1984). *The social logic of space*. Cambridge University Press.

Loh, L. C., & Brieger, W. B. (2014). Suburban Sprawl in the Developing World: Duplicating Past Mistakes? The Case of Kuala Lumpur, Malaysia. *International Quarterly of Community Health Education*, *34*(2), 199–211. https://doi.org/10.2190/IQ.34.2.g

Matejcek, J., & Pribyl, O. (2020). Space Syntax: A Multi-Disciplinary Tool to Understand City Dynamics. *2020 Smart City Symposium Prague (SCSP)*, 1–6. https://doi.org/10.1109/SCSP49987.2020.9133884

Mohd Noor, N. W. (2021). *The Impact of Transportation and Walkability on Residential Property Value* [Master Thesis]. School of Economic Finance and Banking, Universiti Utara Malaysia.

Nagy, O., & Păcurar, B. (2020). The Five-Minute-Walk Distance Concept, Case Study: City of Cluj-Napoca, Romania. *Észak-Magyarországi Stratégiai Füzetek*, *17*(1), 78–87. https://doi.org/10.32976/stratfuz.2020.7

Nasrudin, N., Ismail, H., Abdullah, Y. A., & Khalid, N. S. (2020). Pedestrian Crossing Behavior Model Based on Human Factor. Case Study: Shah Alam City, Malaysia. *Environment-Behaviour Proceedings Journal*, *5*(13), 329–335. https://doi.org/10.21834/e-bpj.v5i13.2109

Nasrudin, N., Khalid, N. S., Abdullah, Y. A., Marzukhi, M. A., & Lim, S. B. (2023). Model of Pedestrian Crossing Behaviour Based on Road Traffic and Human Factors: A Case Study of Malaysia's Shah Alam City. *Planning Malaysia*, *21*(5), 32–47. https://doi.org/10.21837/pm.v21i29.1354

Özbek, M. Ö., Ertürk, F., Çelebi, T. T., Kınacı, Y., & Caymaz, G. F. Y. (2022). Interpretations and Comparisons of Pedestrian Movement and Land Use Activities in Kadıköy Region Using Space Syntax Method. *SAUC - Street Art and Urban Creativity*, *8*(1), Article 1. https://doi.org/10.25765/sauc.v8i1.585

Penn, A., & Turner, A. (2002). Space Syntax Based Agent Simulation. In M. Schreckenberg & S. D. Sharma (Eds.), *Pedestrian and Evacuation Dynamics* (pp. 99–114). Springer-Verlag. http://www.springer.de

Rahman, A., Roy, S. S., Talukdar, S., & Shahfahad. (2023). Rethinking Progress in Approaches and Techniques for the Urban Environmental Studies. In A. Rahman, S. Sen Roy, S. Talukdar, & Shahfahad (Eds.), *Advancements in Urban Environmental Studies: Application of Geospatial Technology and Artificial Intelligence in Urban Studies* (pp. 471–478). Springer International Publishing. https://doi.org/10.1007/978-3-031-21587-2_28

Talmizi, N. M., Ali, N. E. H., & Mokhtar, S. (2022). The Effect of Socio-Demographic Attributes on Walking Behaviour of Residents in Shah Alam City, Malaysia. *Planning Malaysia*, *20*(2), 260–271. https://doi.org/10.21837/pm.v20i21.1110

van Nes, A., & Yamu, C. (2021). *Introduction to Space Syntax in Urban Studies*. Springer International Publishing. https://doi.org/10.1007/978-3-030-59140-3

van Renswouw, L., Lallemand, C., van Wesemael, P., & Vos, S. (2023). Creating Active Urban Environments: Insights from Expert Interviews. *Cities & Health*, *7*(3), 463–479. https://doi.org/10.1080/23748834.2022.2132585

Vidal Domper, N., Hoyos-Bucheli, G., & Benages Albert, M. (2023). Jane Jacobs's Criteria for Urban Vitality: A Geospatial Analysis of Morphological Conditions in Quito, Ecuador. *Sustainability*, *15*(11), Article 11. https://doi.org/10.3390/su15118597

Yasin, M. Y., Mohd Yusoff, M., Abdullah, J., Mohd Noor, N., & Mohd Noor, N. (2021). Urban Sprawl Literature Review: Definition and Driving Force. *Malaysian Journal of Society and Space*, *17*(2), 116–128. https://doi.org/10.17576/geo-2021-1702-10

Yıldırım, Ö. C., & Çelik, E. (2023). Understanding Pedestrian Behavior and Spatial Relations: A Pedestrianized Area in Besiktas, Istanbul. *Frontiers of Architectural Research*, *12*(1), 67–84. https://doi.org/10.1016/j.foar.2022.06.009

Zaleckis, K., Chmielewski, S., Kamičaitytė, J., Grazuleviciute-Vileniske, I., & Lipińska, H. (2022). Walkability Compass—A Space Syntax Solution for Comparative Studies. *Sustainability*, *14*(4), Article 4. https://doi.org/10.3390/su14042033